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IMPACT OF 3D-METAL OXIDES ON THE STRUCTURE AND PROPERTIES OF Fe(Se,Te)-TYPE SUPERCONDUCTORS

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Discovery of superconductivity in FeSe, known as “11 system”, has substantially activated the studies in the field of superconductivity in transition metal chalcogenides [1, 2]. It was found that the critical transition temperature T_c of FeSe be strongly affected by doping or by substitution in both the Fe and chalcogen sublattices, as well as by application of hydrostatic pressure and strains. The aim of the present work is to study the effect of the transition metal oxides TiO_2 and Fe_2O_3 on the properties of the $Fe_{1.02}Se_{0.5}Te_{0.5}$ and $Fe_{1.02}Se$ superconducting materials suggesting that both the iron and chalcogen sublattices may be influenced by introducing these oxides. Polycrystalline samples with nominal compositions $Fe_{0.92}Y_{0.1}Se$ and $Fe_{0.92}Y_{0.1}Se_{0.5}Te_{0.5}$ where (Y = TiO_2 or Fe_2O_3) were prepared by a solid state reaction method. The synthesized samples have been studied by means of X-ray diffraction and electrical resistivity measurements. According to X-ray diffraction the synthesized samples $Fe_{0.92}Y_{0.1}Se$ and $Fe_{0.92}Y_{0.1}Se_{0.5}Te_{0.5}$ contain two phases: the tetragonal phase with the PbO-type structure (space group *P4/nmm*) and hexagonal phase of the NiAs-type structure (space group $P6_3/mmc$). After synthesis and heat treatment, the presence of oxides was not detected in all the $Fe_{0.92}Y_{0.1}Se$ samples, while only small amount of Fe_3O_4 was found to exist in $Fe_{0.92}(Fe_2O_3)_{0.1}$Se0.5Te0.5 and $Fe_{0.92}(TiO_2)_{0.11}Se_{0.5}Te_{0.5}$.

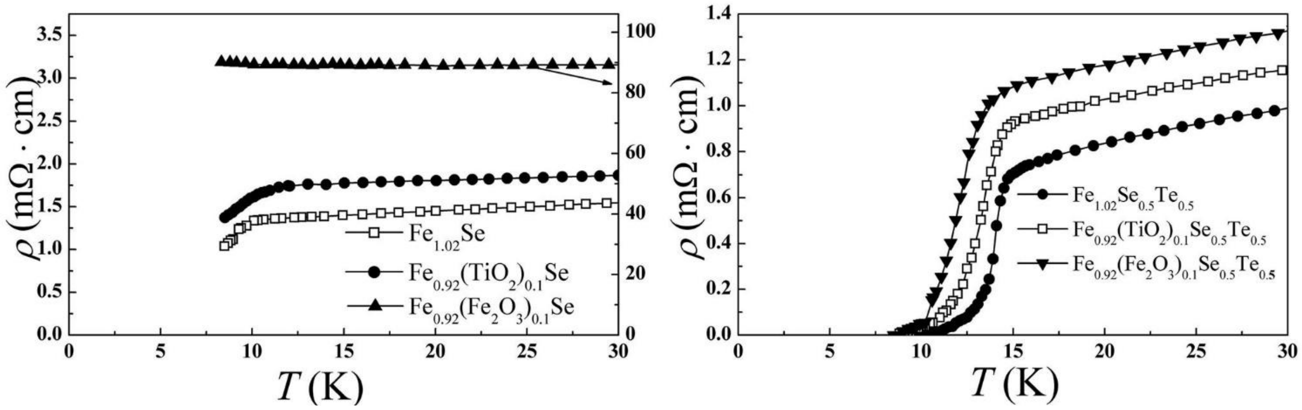

Fig.1 Temperature dependences of the electrical resistivity for $Fe_{0.92}Y_{0.1}Se$ and $Fe_{0.92}Y_{0.1}Se_{0.5}Te_{0.5}$ samples.

The electrical resistivity measurements have revealed (see Fig.1) that $Fe_{1.02}Se$ has onset point of the superconducting transition Tc = 10.3 K which is agreement with published data [1], while for $Fe_{0.92}(TiO_2)_{0.1}Se$, the critical temperature is found to be increased (Tc = 12.4 K). As to the $Fe_{0.92}(Fe_2O_3)_{0.1}Se$ sample, it does not exhibit the transition to the superconducting state. The results obtained have shown the transition metal oxides introduced into charge before synthesis may affect the phase composition and superconducting properties of Fe(Se,Te)-type materials.

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ТЕРМОСТИМУЛИРОВАННЫЕ ПРОЦЕССЫ В ОБЛУЧЕННЫХ КРИСТАЛЛАХ NaF

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THERMALLY STIMULATED PROCESSES IN IRRDIATED CRYSTALS OF NaF

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Nature thermally activated processes these crystals NaF and NaF:Me may be connected, as shown previously for similar systems, and thermal destruction F и $F_2 + F_3^+$ -color centers and subsequent recombination processes.

Для всех моноактивированных составов NaF:Me, где Me, Sc, и Cu , характерными пиками ТСЛ и ТСЭЭ являются пики с максимумами при 320-330, 340-360 и 420-450 K. Это указывает на то, что они связаны с термоактивацией центров захвата, имеющих для каждой характерной температуры (320-330, 340-360 и 420-450 K) одинаковую природу. Отметим, что в неактивированных кристаллах эти центры захвата также проявляются: основные пики ТСЭЭ были зафик-